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Review Article.....!!!

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OCIMUM SANCTUM (TULSI): A MEDICINALLY IMPORTANT PLANT

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ABSTRACT

Tulsi (*Ocimum sanctum*) is mentioned in Ayurveda and belongs to the genus *ocimum* of the family Lamiaceae and is widely distributed in tropical and warm temperate regions. It is commonly used in folk medicines to treat different diseases for e.g. upper respiratory tract infections, diarrhea, headache, ophthalmic, skin diseases, pneumonia, cough, fever and conjunctivitis. This review focuses on the therapeutic potential of a large number essential oils, cineole, carvacrol, eugenol, eugenol, methyl eugenol and secondary metabolites like phenols, alkaloids, steroids, sterols, saponins, flavones, flavonoids, tannins etc. Its pharmacological uses include antiviral activity, antibacterial activity, antifungal activity, antidiabetic activity.

INTRODUCTION

The medicinally important plants are having secondary metabolites (which are potential sources of drug) and essential oils of therapeutic importance. Tulsi (*Ocimum sanctum*) is mentioned in Ayurveda having many medicinal properties with a wide therapeutic range. It belongs to the genus *ocimum* of the family Lamiaceae. Tulsi is known from as early as the vedic period. It belongs to the class of aromatic plant which is native throughout the Eastern World tropics and widespread as a cultivated plant [1]. Tulsi (*Ocimum sanctum* L.) has been documented well in Ayurveda because of its therapeutic activities and described as Dashemani Shwasaharni (antiasthmatic) and anti-kaphic drugs (Kaphaghna) [2]. *Ocimum sanctum* L. (Tulsi), *Ocimum gratissium* (RamTulsi), *Ocimum canum* (Dulal Tulsi), *Ocimum basilicum* (Ban Tulsi), *Ocimum kilimandscharicum*, *Ocimum ammericanum*, *Ocimum camphora* and *Ocimum micranthum* are the known important species of genus *Ocimum* that grow in different parts of the world and are known to possess medicinal properties [3,4]. It is native to India and reached western Europe in 16th century.

Synonymous:

Tulsi is also known as *Ocimum sanctum* (Rama and Krishna Tulsi varieties) or more recently *Ocimum tenuiflorum* and *Ocimum gratissimum* (Vana Tulsi variety).

Scientific Classification [5]

Kingdom: Plantae

Order: Lamiales

Family: Lamiaceae

Genus: *Ocimum*

Species: *Ocimum. tenuiflorum*

Binomial name: *Ocimum tenuiflorum* or *Ocimum sanctum* L.

Historical background

In Ayurveda Tulsi (*Ocimum sanctum* L.) has been well described for its therapeutic potentials and described as Dashemani Shwasaharni (antiasthmatic) and antikaphic drugs (Kaphaghna). *Ocimum sanctum* L. is considered sacred by Hindus and is used as medicinal plants in day to day practice in Indian homes for various ailments [6]

Several medicinal properties related to the Tulsi plant not only documented in Ayurveda and Siddha but also mentioned in Greek, Roman and Unani systems of medicine [7].

Geographical Distribution

It is widely distributed in tropical and warm temperate regions. *Ocimum* occurs naturally in tropical America, Africa and Asia

Morphology [8]



Root:

Its root are Hairy, soft, thin, greenish brown externally & Pale blackish internally, branched.

Stem:

It is Branched, erect, hairy, subquadrangular, externally greenish, internally cream, herbaceous, woody, fractured, fibrous, in barks & short in xylem, odour - faintly aromatic.

Leaf: leaf of Green types of *Ocimum sanctum*.

It is having an Aromatic odour with pungent taste, exstipulate, opposite, petiolate. Petiole is having 2.5 to 3.0 cm length, slender in shape, thin, pubescent with narrow adaxial groove, lamina elliptical to ovoid, oblong 5-6 cm in length and 2.5 cm to 3 cm in breadth, pubescent, margin entire, irregularly undulated or bluntly serrate, apex acute or obtuse, adaxial surface bright green, with prominent veins, venation is pinnately reticulate with 5-6 alternate pairs of lateral veins, glandular dots seen minutely on the abaxial side.

Flower: Aromatic, taste pungent, small inclose whorls, bracts about 3 mm long and broad, Crimson coloured, pedicles longer than calyx, slender, pubescent calyx ovoid, 3-4 mm bilipped, upper lip broadly obovate or sub orbicular in shape, shortly apiculate, lower lip longer than upper having form mucronate teeth, corolla 4 mm long, pubescent, odour.

Fruit:

Odour is aromatic, pungent in taste, having group of 4 nut lets, each with one seed, enclosed in an enlarged, membranous, veined calyx, nut letssubglobose or broadly elliptic in shape, slightly compressed, near smooth, pale brown or reddish in colour with small black marking at the place of attachment to the thalamus.

Seed:

Round to oval, brown in colour, 0.1 cm in length, slightly notched at the base, odourless, taste-pungent, slightly mucilaginous in nature.

Chemical constituent [9]

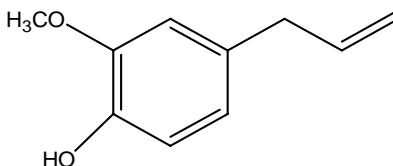
Its leaf is having pleasant odour of volatile oil (0.1 to 0.9%). The oil content in the drug varies depending upon the type, the place of cultivation & season of its collection. The oil is collected from the leaves using steam distillation method. It consists of Eugenol (70%) Carvacrol (3%), Eugenol methyl ether (20%) Caryophyllin, linalool, Aneole, Chavicol, nerol, terpinin 4 - 01, decylaldehyde, r-selinene, α & β pinenes, champhor sesequiterpenes. Besides the volatile oil, the plant also consists of alkaloids, glycosides, saponins and tannins. The leaves contain ascorbic acid carotene, appreciable amount of Vitamin C, traces of maleic acid, citric and tartaric acid. The chemical constituents isolated from various parts of the plant such as eugenol, cardinene, cubenol, borneol, linoleic acid, linolenic acid, oleic acid, palmitric acid, steric acid, Vallinin, Vicenin, Vitexin, Vllinin acid, Orientin, Circineol, Gallic Acid, vitamin A, vitamin C, phosphrous and iron. essential oils, cineole, methyl chavicol, carvacrol, eugenol, eugenol methyl ether, methyl eugenol, p-cymene etc and

secondary metabolites like phenols, alkaloids, steroids, sterols, saponins, flavones, flavonoids, tannins etc

Eugenol:

Eugenol is a phenolic compound and a member of the phenylpropanoids class of chemical compounds. It is a clear to pale yellow in colour oily liquid extracted from certain essential oils. It is a major constituent of essential oils extracted from different parts of Tulsi plant [10].

Structure of eugenol:



Plant sources of eugenol

It has great importance in pharmaceutical industry and is mainly extracted from clove buds of *Eugenia caryophyllata Thumb*, belonging to family Myrtaceae, and from leaves and barks of *Cinnamomum zeylanicum Breyn* (also known as Dalchini in Hindi), belonging to family Lauraceae [11]. The above two are rich sources of eugenol containing about 70–85% and 20–50% eugenol respectively. In contrast to the above mentioned sources *Ocimum sanctum L.* (Tulsi) and *Ocimum basilicum* (Ban Tulsi) are cheaper sources for commercial extraction of eugenol [12].

Pharmacological Action:

Different parts of Plant e.g roots, stems, leaves, flowers, seeds are known to possess Analgesic, Expectorant, Antiinflammatory, Antiasthmatic, Antidiabetic, Antiemetic, Antifertility, Hypotensive, Hypolipidemic, Antistress, Hepatoprotective properties. It is commonly used in folk medicines to treat different diseases for e.g. upper respiratory tract infections, diarrhea, headache, ophthalmic, skin diseases, pneumonia and also a treatment for cough, fever and conjunctivitis.

1) Antibacterial activity

O.sanctum show narrowest spectrum of antibacterial activity [13]. Its crude aqueous extract of leaf possesses antibacterial and immunomodulatory activity [14]. The ethanolic extracts of Tulsi from the leaves showed better activity against the beta-lactamase producing methicillin-resistant *Staphylococcus aureus* strains [15]. Its Aqueous extract showed growth inhibition of *Proteus*, *Staphylococcus aureus* and *E. coli*. Alcoholic extract showed growth inhibition of *Vibrio cholera*.

2) Antifungal activity

Ocimum sanctum showed to act against some fungal etiological agents as *Candida albican* [16], *Fusarium solani* f. sp. *Melongenae* [17], *Aspergillus flavus* and aflatoxin B1

(AFB1) production [18], *Aspergillus niger*[19], *Aspergillus repens*, *Curvularia lunata* and *Fusarium moniliforme*.

Ethanollic extracts of *O. sanctum* (whole plant) showed to have 21-30 mm zone of inhibition against *Candida albicans* [20] and were less effective in comparison to aqueous extract

3) Antiviral agent

Taking different extracts, the antiviral activity of *O. sanctum* was assessed against many important viral agents as fish pathogenic viruses viz. Infectious hematopoietic necrosis virus (IHNV); Oncorhynchus masou virus (OMV); Infectious pancreatic necrosis virus (IPNV) D [21], polio virus type [22], herpes viruses (HSV), adenoviruses (ADV), hepatitis B virus and RNA viruses viz. coxsackievirus B1 (CVB1), enterovirus 71 (EV71) [23], white spot syndrome virus (WSSV) in shrimp [24] Buffalo pox virus (GTPV) [25], New Castle Disease Virus and infectious bovine rhinotracheitis virus (IBR).

4) Antidiabetic:

Ethanollic extract of the *O. sanctum* L. significantly decreases the blood glucose level, glycosylatedhemoglobin and urea with a simultaneous increase in glycogen, hemoglobin and protein in streptozotocin-induced diabetic rats[22]. This extracts also resulted in an increase in insulin and peptide levels and glucose tolerance. Constituents of *O. sanctum* L. leaf extracts have stimulatory effects[23] on physiological pathways of insulin

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